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It is generally held that the origin of a biological organism is an essential characteristic of the identity of the organism (in all possible worlds, if the organism exists it will have the same origin). It is further generally held that the spatiotemporal continuity of a material object (whether animate or inanimate) is a necessary requirement of the identity of the object. I wish to show, first, that serious questions can be raised as to whether the origin of objects (which are not biological organisms) is an essential characteristic of their identity; second, that the principle of spatiotemporal continuity must be reformulated, giving way to three sub-principles of spatiotemporal continuity, if it is to cover all cases of preservation of identity of such objects. I shall also discuss the significance of the history of an object and its recoverability (from destructive damage) for the preservation of the identity of the object.

Take first the case of an ancient vase which has been found destroyed but has been restored by the museum technicians. We say in such circumstances that we have recovered the vase and that the vase in the museum is the ancient vase. There might be some quantitative difference between the initial and the restored states of the vase—such as traces of the crack and the glue—but the numerical identity is unquestionable. Now, since the vase had ceased to be during the interval between its breaking into pieces and its being restored, we shall speak of the destruction or the catastrophe rather than the damage of the vase. If it becomes necessary to emphasize that there can be no restoration of the destroyed object we shall speak of the terminal catastrophe of the object. Speaking of 'the broken vase' does not commit one to speaking of the vase in its broken phase, any more than speaking of one's dead father commits him to speaking of the dead phase of his father. Rather it should be understood that one is either speaking of the vase which subsequently broke or the pieces which were produced from the breaking of the vase; which of the two will be clear from the context. But it should not be thought that the pieces produced by the destruction of the vase comprise a phase of the vase, simply because the vase has ceased to be; there is no vase once it is broken into pieces.

Since the broken pieces of the vase that was restored in the museum were the connecting link between the ancient vase and its restoration in the museum we can speak of them as being the medium for the preservation

of the identity of the vase. But not every product of the destruction of the vase can serve as such a medium. For example, if a vase was pulverized or shattered no restoration procedure would recover the initial vase. This realization seems to lead to the conclusion that whether or not the destruction product serves as a medium for the preservation of the initial object will depend on the state, the condition of this product. But this is not the case. The condition of the destruction product is only one of the two factors determining whether this product is such a medium. The second factor is altogether independent of the product and has to do with an external factor, namely, the skill present in the environment of the product for restoring the initial object. This means that whether a particular destruction of the object is a terminal catastrophe or not is relative, depending on, first, the degree of destruction and, second, the skill of the society for recovering the object. The same destruction product, e.g. the vase pieces, might be a terminal catastrophe in a primitive society where the recovery is impossible, but a non-terminal one in a contemporary society.

One might find the above conclusion counter-intuitive, wishing to confine the possibility of the recovery of the initial object to the state of the object itself. There are two directions one could follow to support this claim: either to hold that all destruction products are candidates for serving as media for the preservation of the identity of the original object, and hence that there are no terminal catastrophes but only temporary ones; or, that a terminal catastrophe is that which is terminal in all possible worlds, so that we could not have the case where the destruction of an object comprises a terminal one within one society and a non-terminal one within another (as in the case of the vase pieces in the primitive and the contemporary society). Both claims comprise refutations of the relativity of the terminality of a catastrophe, the first by accepting no catastrophe as a terminal one and the second by considering as terminal only the catastrophes that are terminal in all possible worlds. The first position, that all destruction situations are states from which the object could, either at the present or at some time in the future, be recovered, comes into conflict both with our intuitions regarding some destruction situations and with current scientific belief. We certainly would not accept that a chair, burnt to ashes, could be recovered, or that from a pool of petroleum we could restore the organic matter it came from. Further, scientists believe that β-particle decay is an irreversible process. Generally, in order to avoid the counter-intuitive dependence of the terminality of the catastrophe of a particular object on the skill of the environment, we would have to do an injustice to our even stronger intuitions that there are certain catastrophes of objects which are terminal and after which the object cannot be recovered. The second group of intuitions is too firmly positioned in our belief world to be given up for the sake of the first.

The difficulties of the second position, that a terminal catastrophe is one that is terminal in all possible worlds—and not just relative to a particular society—stem from our inability to pass a judgment in every possible world as to whether the catastrophe is terminal or not. In fact, the limitation of the terminal catastrophes to only the terminal ones in all possible worlds in effect boils down to the first position, namely that *every* destruction situation is a possible medium for the preservation of the identity of the object and for its future recovery. As adherents of the second position we shall not be able to speak of any terminal catastrophes because for any such candidate we can always say that it appears to be a terminal catastrophe according to the limits of present science and technology but that this might not be the case in the future, i.e. in some possible world. Possibly future technology will allow for the restoration of a shattered or even pulverized vase (so one could claim, anyway, since there is no proof of the opposite). Hence, the second position in effect reduces to the first where we cannot speak of any terminal catastrophes at all, and the objections to the first apply here as well. Consequently, one feels inclined to accept the position that whether a catastrophe of an object is terminal or not will depend not only on the state of the destruction product but also on the skill in the environment for the restoration of the initial object. And one does that despite the fact that there is a counter-intuitive element involved in introducing an external factor—the skill in the environment—for the determination of the terminality of the catastrophe of an object, a state that would be expected to involve only the condition the destroyed object is in. The result of this relativism is that within every society we shall have certain catastrophe situations being stereotypically terminal, some borderline cases and some stereotypically non-terminal ones, and moving from one society to another would result in a redistribution of the destruction situations into these three groups.

We have so far seen that 'ceasing to be' does not always result in a permanent loss of the object; an object can cease to be and subsequently be recovered, the intermediate state serving as a medium for the preservation of the identity of the object. Let us now turn our attention from ceasing to be to coming to be. When the recovered vase comes to be in the museum technician's workshop and is considered to be numerically identical to the ancient vase which came to be in the potter's workshop, are we thereby committed to treating the origin of an object as a non-essential characteristic of the object? Consider a prefabricated house. The house ceases to be when the walls are piled up in one's backyard. and comes to be each time we erect the walls and put them together in the appropriate manner. The house is the same every time, being numerically identical to the house that came about as a result of previous erections of the prefabricated walls. So, though the origin of the house erected every summer is different,

since we have a different erection each summer, the house resulting from each erection is one and the same. This, then, is a second case where the origin of the object is found to be non-essential for the identity of the object.

To avoid rendering the origin of an object non-essential, one might suggest that in such cases the origin of the objects was in fact the same, the initial one, and that the subsequent instances of coming to be of the objects are not originations of the objects. The origin of the vase was in the potter's workshop and the technician's reconstruction was a coming to be but not the origin of the vase. Similarly, the origin of the prefabricated house was the construction of it in the factory and each erection of it was a coming to be but not the origin of the house. But there are other cases which show that this is not a general way out of the difficulty, and that we cannot salvage the essentiality of the origin of objects through it. Consider a child playing with his cubes in his room. At some point he constructs a pile which catches his fancy and he decides to keep it intact in the corner of his room. After two years go by he accidentally destroys the pile one day; when he rebuilds the pile, what he has is not a new pile but a restoration of the same pile, the pile that is already two years old. This second pile, which is numerically identical with the first one, has a different origin from the first one. The two constructions of the pile are similar in every aspect, so we cannot in this case claim that one is the origin while the second is only a coming to be. In the case of the vase and the prefabricated house, the dissimilarity between the first coming to be—in the potter's workshop or the factory—and the subsequent ones—in a reconstruction of the vase or an erection of the house—might offer intuitive support for a distinction between the origin of the objects and a subsequent coming to be. But in the case of the boy's pile of cubes the first and the second constructions are qualitatively the same. So there would be no grounds for holding that the coming to be of the first pile was the origin of both piles while the coming to be of the second pile was unworthy of being the origin of the second pile. In fact, to emphasize that the two piles have different origins we can imagine that it was the mother of the child who accidentally destroyed the pile and then restored it. Here again, though the second pile has a different origin from the first, it will be considered to be the same pile that has been standing in the corner of the room for the past two years. Consequently, there are cases where the origin of an object is not essential to the identity of the object.

The above example can involve us in further complications. Suppose that in order to salvage the essentiality of origin for identity one suggested that the construction of the second pile does not qualify as the origin of the pile since the child or the mother would have to copy the structure of the first pile. Hence, the origin of the pile was the construction of the pile when it was first conceived rather than any subsequent reconstruction

of it. But suppose the younger brother of the boy, being jealous of his older brother's pile, destroys it and builds a pile precisely like his brother's pile in the same corner of the room; now it is his own pile. In this case despite the fact that the second construction copied the first, the second construction is considered as much of an origin of the second pile as the first is of the first pile. In this case, the two piles are different. What makes the difference in considering the piles the same or not is not whether the structure of the second pile is an original conception or not, but whether it is *intended* to be the same pile or not. In the case of the accidental destruction of the pile the reconstruction was intended to produce the first pile, while in the case of the younger brother's destruction of the pile the reconstruction was intended to produce a new pile. The importance of the intention of the reconstruction can be so significant that if the mother of the older child destroyed the initial pile in order to recreate it in the summer house in the corner of the child's room—so that the child would not miss his pile—the pile would be considered to be the same, despite the change of location—a significant factor in the determination of the identity of the pile in its own two year history. So, having a different origin does not imply that two objects cannot be numerically identical (i.e. be phases of the same object); but the intention of reconstruction can make all the difference in determining whether the new object is numerically identical to the old one or not.

Before closing the discussion on the essentiality of the origin of an object, we should emphasize the importance that the history of the object plays in these considerations. Suppose an artist made a wax statue and as soon as he finished it he melted it down and using the same wax and mould made a new statue. One would not be inclined to consider the first and the second one as one and the same statue. Yet, if the first wax statue stood in the artist's studio for ten years until accidentally knocked down and destroyed by the artist, his subsequent reconstruction of the statue using the same wax and mould would be considered as the production of the same statue. In the first case, the first statue has no history and hence no power to incorporate the second statue as a phase of it. But in the second case the history of the first statue is long enough to incline one to consider the reconstruction of the statue on a par with the reconstruction of the vase by the museum technician. So, in the case of the absence of a long history, the origin of the second statue is considered essential for the identity of the statue, thus rendering the second wax statue different from the first. In the case of the aged statue—in the artist's studio—the origin of the reconstructed statue is not considered essential so that the reconstructed one comprises a phase of the initial—now recovered—statue.

In all the above discussion a question has been pressing itself on which we must now focus our attention: how is the principle of spatiotemporal continuity respected in the cases where the object ceases to be and is then restored?

Discussion

R. C. Coburn[1] has collected a number of quotations in which various philosophers state the principle of spatiotemporal continuity, two of which are the following:

> In the case of ordinary 'material things', e.g. tables and stones, we can speak of spatiotemporal continuity . . . as a logically necessary condition of identity . . .
> It is part of our common-sense concept of a thing that its existence is spatiotemporally continuous. It never leaps gaps in either time or space.

Yet clearly, when the vase was destroyed it ceased to be and when it was restored it came to be again; the initial and the restored vases are numerically identical, yet there is a period of time in between the first and the second phase during which the vase has ceased to be. In the case of the prefabricated house, the intervals during which the walls are piled up in the backyard are intervals in which the house has ceased to be; and yet each erection produces a house numerically identical to the previous erection. Similarly for the pile of cubes that the child accidentally destroyed after two years and then reconstructed. It is numerically identical to the first, though not spatiotemporally continuous with it. My point is not that the principle of spatiotemporal continuity is arbitrarily disrespected in some cases, or that there are in general exceptions to it, but that we need to reconstrue the principle by breaking it down to three sub-principles which will cover the above cases, as well as others that are mentioned below. The reformulated principle of spatiotemporal continuity will be the following:

Two objects can be found to be different phases of one and the same object if:

(a) The form of that object remains spatiotemporally continuous throughout the two phases and the interval (if any) between them. Or,
(b) The parts of that object, remain spatiotemporally continuous throughout the same period. Or,
(c) The matter of that object remains spatiotemporally continuous throughout that period.

In this way, though the object itself does not remain spatiotemporally continuous, its identity is preserved and the object is recovered on account of the fact that either its form or its parts or its matter remains spatiotemporally continuous.

Let us consider examples corresponding to each of the above cases.

[1] In *Identity and Individuation*, M. K. Munitz (ed.) (New York University Press, 1971), 51–52; the first quotation is from Sydney Shoemaker and the second from D. M. Armstrong.

Neurath's ship that is being rebuilt plank by plank until all the planks have been replaced, is a case where only the form remains spatiotemporally continuous throughout the first phase, the renovated phase and the period in between. The parts and the matter did not remain so since they were replaced by others. Similarly, if a church is rebuilt brick by brick what remains spatiotemporally continuous is the form of the church and nothing else. An example of the second case of spatiotemporal continuity is the example of the prefabricated house. Between two erections of the house the parts (walls, etc.) of the house remain spatiotemporally continuous, but not the form. An example of the third case, when the matter remains spatiotemporally continuous, is the following. Suppose we have a parcel of material composed of XY molecules (where 'X' and Y' are symbols signifying chemical elements). We divide the parcel into two parts and then pass them through a catalyst which results in the separation of the X and Y atoms. Then we bring the X and Y atoms under such conditions that they form XY molecules again and then merge the two parts into one, thus recovering the initial parcel of material. Throughout this period of time only the matter, the X and Y atoms, remained spatiotemporally continuous. Neither the form nor the parts of the initial parcel did so. The form was lost when we divided the parcel into two parts and the two parts of XY material ceased to be when we reached the stage where there was no XY material at all but only X and Y atoms. Even if one considers the molecules out of which the parcel is made up as being parts of the parcel—on a par with the parts we get when we divide the parcel into two—even then we get no spatiotemporal continuity of the parts, since there is a stage during which there are no XY molecules. One could, though, think of the atoms, even the sub-atomic particles, as being parts of the initial parcel. In that case we do away with the distinction between parts and matter and we would simply merge (b) and (c) in the reformulation of the principle into one.

Matter has been treated as a special case in order to make the principle explicit enough to exclude cases where the matter is transformed into other forms of energy. For example, in the case of a sub-atomic particle which at some point scatters into energy, even if there were a way to absorb the emitted energy and transform it into a particle of the same type as the original one, we would be reluctant to say that we had recovered the initial particle. The reason for our reluctance is that our criteria of identity concerning quanta of energy and elementary particles are not such as to urge us to treat the new particle as numerically identical to the first one. If a quantum of energy had been supplied in place of, but equal to the one emitted during the scattering, and the new particle formed from the supplied energy, we would have no more and no less reason to consider this particle as numerically identical to the initial one. The two quanta of energy would be indistinguishable but for their origin, i.e. the scattering and the different source; our intuitions are not strong enough to take a determinate position on whether

that energy can serve as a medium for preserving the identity of the particle or not. Further the identity criteria for elementary particles leave us neutral as to whether the recreated particle is numerically identical with the initial one—i.e. is a phase of it— or not. For this reason it was thought best that we should exclude other forms of energy than matter as vehicles for the preservation of the identity of an object between two phases of it. The purpose of the third sub-case in the principle is to emphasize that matter is the last step in the reduction of the object into parts or elements, and that its transformation into other forms of energy does not guarantee the possibility of the recovery of the object. When and if ever we actually achieve this with objects, i.e. when we can transform the matter of an object (especially an object other than an elementary particle) into some other form of energy and back into matter, then we shall have grounds for developing sharper criteria for determining numerical identity between the initial and the recovered object.

The case is similar with a magician who instantaneously makes a rabbit vanish from under the cloth and reappear in his hat. Our physical laws do not allow us to believe in the possibility of such spatiotemporal translations. If our physics changed with respect to these laws, then the principle of spatiotemporal continuity would have to be updated accordingly, since we would then be allowing for spatiotemporal leaps which we are not now prepared to accept if we wish to remain consistent with the laws of our physical system and accord with the intuitions that these laws have developed in us.

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